VARIATIONS IN MYOSTATIN HAEMOGLOBINS AND MORPHOMETRIC CHARACTERISTICS IN THREE BREEDS OF RABBIT

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ABSTRACT
Long term reliance on genotyping alone is not enough in selection and it has to be complimented by using the morphometric attributes. Hence, variation in Myostatin haemoglobins and morphometric parameters in three breeds of rabbit was investigated. There have been instances where genotypic expressions alone or morphometric attributes alone will not be enough to identify the breeds of an animal, hence other criteria have to be brought in so that a breed cannot be misrepresented for another breed.The three different breeds of rabbit used were: Hyla, New Zealand White and Cinnamon. Morphometric parameters (head length, head width, chest circumference, ear width, chest depth, chest width, Humerus, tibia, femorus, width of spine, radius and ulna, head height, ear length and length of spine) were taken from the rabbits across the three breeds using a measuring tape while blood samples were also collected on Whattman filter papers. The rabbits were intensively raised for 16 weeks. Blood samples were collected and taken to the Biotech laboratory for haemoglobin assay using electrophoresis and Myostatin genotyping using standard procedures. Morphometric parameters (head length, head width, chest circumference, ear width, chest depth, chest width, Humerus, tibia, femorus, width of spine, radius and ulna, head height, ear length and length of spine) were all taken using measuring tape. DNA extraction was carried out using Blood-Plant Animal DNA preparation kit following standard procedures. Data were subjected to analysis of variance (ANOVA) according to SAS (2004) and means were separated using new Duncan multiple range test. The results confirmed that the three rabbit breeds exhibited both Myostatin genotypes AA and BB whereas the AB, AO and OO genotypes were not observed among the rabbit breeds. The three breeds examined exhibited Myostatin haemoglobins AA and BB and were identical for some morphometric parameters such as Head Length, Head Width, Chest Circumference, Ear Width, Chest Depth, Chest Width, Humerus, Tibia and Femoris.
Keywords: Myostatin, Genotypes, Haemoglobins, Variations, Morphometric, Breeds

INTRODUCTION
Rabbit farming in Nigeria is faced with myriad of problems, which have resulted to a gross shortage of meat to meet up the population challenge in our dear country (Nworgu, 2007). The growth rate of the Nigerian agricultural sector is below the potentials of natural and human resources due to high cost of agricultural inputs, poor funding of agriculture, inadequate functional infrastructural facilities, inconsistencies of government agricultural policies, inadequate private sector participation, poor mechanized farming and little or no adoption of some simple agricultural technologies developed by scientists (Nworgu, 2007). In Nigeria, consumption of animal protein remains low at about 6.0-8.4 g/head/day which are far below the 13.5 g per day prescription of the World Health Organization which can be corrected by rabbit production as a veritable way of alleviating animal protein deficiency in Nigeria (Ajala and Balogun, 2004).

Breed characterization of livestock is the first approach to a sustainable use of its animal genetic resource (Lanari *et al*., 2003). The first knowledge of the characterization of local genetic resources falls on the knowledge of the variation of morphological traits (Delgado *et al.,* 2001). Morphormetric measurements have been found useful in contrasting size and shape of animals (Ajayi *et al*., 2008). Growth which is the totality of the bodily development that can be seen phenotypically, is the main economic trait needed for improved profitability for farmers and adequate meat for the consumers. Genetic improvement of rabbit is a vital scope on the way to increasing their contribution to the much-needed animal protein in developing countries (Okoro *et al*., 2010).

Towards value addition in rabbits, producers are more interested in the various parts of the animal body in relation to others to optimize returns on production, as this has a direct impact on their feed efficiency

and performance. Hence, there is a need for Animal Breeders and Geneticists to establish the relationship that exists between these morphometric traits and to organize the breeding programmes in a manner to achieve an optimum combination of body weight and good conformation for maximum economic returns. The sequence and function of myostatin appear to be highly conserved among vertebrate species, and its role during myogenesis of chickens was expected to be similar to that observed in other mammals. Mutations in myostatin regulatory regions have been shown to be associated with abdominal fat weight, abdominal fat percentage, birth weight, breast muscle percentage and breast muscle weight in chicken (Gu *et al.,* 2004).

Functionally, lack of myostatin (MSTN) results in the excessive growth of skeletal muscle, which delineates the existence of a powerful mechanism to control muscle size in normal individuals. These results provide strong evidence that myostatin is a negative regulator of skeletal muscle growth in animals. The polymorphisms of this gene have been reported to be associated with production traits which make it a candidate gene to enhance the productivity of livestock and fowl (Zhang *et al.,* 2012). The MSTN is mainly expressed in skeletal muscles which control the growth of the muscles by suppressing proliferation and differentiation of myoblast cells in mammals. Mutations in the myostatin gene were associated with the double–muscling phenotype in cattle (Zhang *et al.,* 2012). Variation in Morphometric characteristics is an important tool for selection and breeding, and therefore important to animal improvement. Establishment of variation in myostatin haemoglobins (haemoglobin polymorphisms) among different breeds of rabbit is key to rabbit improvement and optimal productivity. The objective of the study was to evaluate the variation in Morphometric characteristics of three (3) different breeds of rabbit in relation to their myostatin haemoglobins.

MATERIALS AND METHODS

Study location

The study was carried out at the Rabbitry Unit of the Federal College of Animal Health, I.A.R&T, Ibadan, Nigeria and the experiment lasted for 20 weeks.

Data collection

The animals were intensively managed, and from week 4, morphometric indices were recorded using tape measure for the three breeds of rabbit and at the twentieth week, blood was bled from the jugular vein and blood stains were sampled on whattman filter paper for electrophoretic studies. The blood samples were then taken to Biotechnology Laboratory, Abeokuta, Ogun state for genotyping.

DNA extraction and electrophoresis

DNA Extraction is a routine procedure used to isolate DNA from the nucleus of cells. The extraction was carried out using Blood-Plant Animal DNA preparation kit following standard procedures.

Data analysis

Data were subjected to analysis of variance (ANOVA) according to SAS (2004) and means were separated using the new Duncan's multiple range test.

RESULTS AND DISCUSSION

This result showed that were no significant differences ($P<0.05$) in the head length and the head width across the three breeds (Table 1). The head height in Hyla and New Zealand White showed superiority ($P<0.05$) as they were significantly higher when compared to the head height of Cinnamon. The chest circumference of all the rabbit breeds showed no significant difference, ear length of Cinnamon is relatively smaller when compared to that of Hyla and New Zealand White. There were no significant differences in the ear width of all the breeds examined. The chest depth and chest width of all the rabbits were all the same as there were no significant differences ($P<0.05$). There are significant differences in the radius-ulna across the breeds wherein Cinnamon recorded higher morphometric parameter than Hyla and New Zealand White ($P<0.05$). The Tibia and Humerus had no significant difference as the parameters collected were all the same across the breeds examined. This result agreed with the findings of Brahmantiyo *et al.* (2017) who recorded similar results in Hyla and New Zealand White rabbits. The

Myostatin genotypes of the examined breeds of rabbits showed only two haemoglobin variants with their respective corresponding genotype haemoglobins AA and BB which are under the control of two codominant alleles (HBA and HBB) (Figure 1). This implies that there is a possibility that there are no

pure breeds among the three breeds of rabbits evaluated. This corroborates the study of Lukefahr (1985), who reported that most rabbits in sub-Saharan Africa have become heterozygous and this is due to the unplanned crosses of several breeds of rabbit that were imported at different times. The result of the Myostatin haemoglobin polymorphisms, of the examined breeds of rabbit showed that genotype HbAA and HbBB were identical for some morphometric parameters such as Head Length, Head Width, Chest Circumference, Ear Width, Chest Depth, Chest Width, Humerus, Tibia and Femoris.

Table 1: Morphometric Characteristic of rabbit breeds at sixteen weeks in relation to myostatin haemoglobins.

Parameters (cm)	HYLA	NZW	CINNAMON
Genotype	AA, BB	AA, BB	AA, BB
Head length	6.885±0.3	6.425±0.28	6.635±0.405
Head width	2.575±0.185	2.555±0.125	2.65±0.21
Head height	3.17±0.20[a]	3.22±0.14[a]	2.65±0.21[b]
Chest circum.	16.605±0.925	16.39±0.62	15.94±1.13
Ear Length	6.95±0.275[a]	6.97±0.425[a]	6.885±0.38[b]
Ear width	3.95±0.225	4.025±0.24	4.15±0.275
Chest depth	5.205±0.05	5.05±0.735	5.25±0.05
Chest width	4.475±0.365	4.25±0.325	4.66±0.47
Radius ulna	5.30±0.395[b]	5.355±0.245[b]	5.555±0.43[a]
Humerus	5.08±0.325	5.00±0.095	4.975±0.41
Tibia	7.79±0.23	7.52±0.205	7.55±0.305
Femoris	6.375±0.165	6.47±0.115	6.375±0.15
Length of the spine	19.13±1.305[b]	19.575±0.56[b]	19.84±1.085[a]
Width of the spine	4.67±0.28	4.56±0.40	4.89±0.50

[ab] Means along the same row with different superscripts are significally different (p< 0.05).

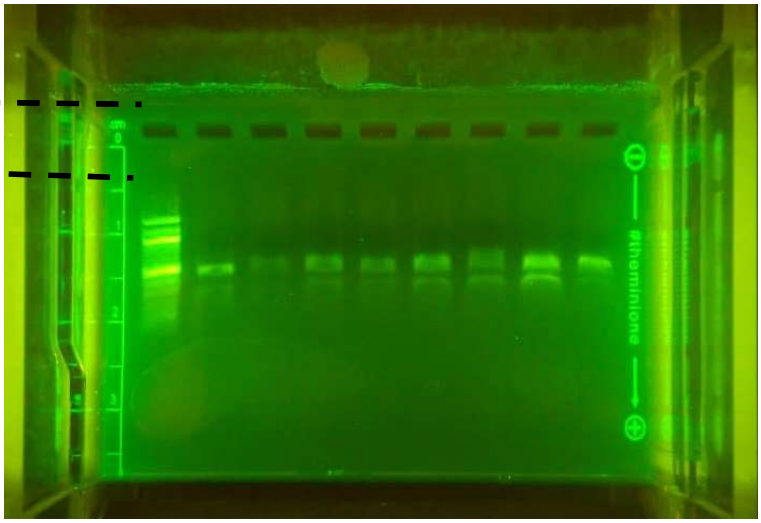


Figure 1: Picture of the Myostatin Genotype Bands taken during Electrophoresis

CONCLUSION AND RECOMMENDATION

This study revealed that the three breeds of rabbit used; New Zealand White, Hyla and Cinnamon exhibited the same Myostatin haemoglobins; AA and BB. Also, some of the morphometric characteristics of the breeds considered were identical (head length, head width, chest circumference,

head width, chest depth, chest width, humerus, tibia, femorus, width of the spine) while they significantly differed in some parameters: (head height, ear length, radius-ulna and length of spine). Selection of rabbit breeds for breeding purposes should be complemented by morphometric characteristics rather than polymorphic studies alone.

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